Standard 1

Number Sense and Computation

CORE STANDARD

Number Sense and Computation

Place Value

Understand and use the relationship among whole numbers, including place value, to identify and compare numbers. Interpret and model decimals as parts of a whole, parts of a group, and points and distances on a number line.

[Standard Indicators: 4.1.1, 4.1.3, 4.1.4]

Multiplication and Division Facts

Demonstrate fluency with multiplication facts for numbers up to 10 and related division facts.

[Standard Indicator: 4.1.5]

Multiplying Whole Numbers

Multiply numbers up to 100 by single-digit numbers and two-digit numbers.

[Standard Indicator: 4.1.6]

Addition and Subtraction of Fractions

Model addition and subtraction of simple fractions.

[Standard Indicators: 4.1.2, 4.1.7]

4.1.1 Count, read, write, compare and plot whole numbers using words, models, number lines and expanded form.

Example: Plot the number 980,000 on a number line labeled in increments of 100,000s.

4.1.2 Find equivalent fractions and then use them to compare and order whole numbers and fractions using the symbols for less than (<), equals (=) and greater than (>).

Examples:

- Find three equivalent fractions for $\frac{1}{4}$.
- List from least to greatest: $\frac{7}{8}$, $\frac{1}{4}$, $\frac{2}{4}$ and $\frac{1}{3}$.

4.1.3 Solve problems involving decimals to hundredths.

- Interpret and model decimals as parts of a whole, parts of a group, and points and distances on a number line.
- Use benchmarks (well-known numbers used in meaningful points for comparison) to compare decimals between 0 and 1.0.
- Write decimals as fractions.

  Examples:

  - Model 0.4 on a ten-by-ten grid.
  - Place 0.5 and 0.8 on a number line marked in tenths.
  - Is 0.4 closer to 0 or to 1?
  - Write 0.4 as a fraction.

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4.1.4 Use words, models, standard form and expanded form to represent place value of decimal numbers to hundredths.

Example: Explain how you know that 0.4 is equal to 0.40.

4.1.5 Demonstrate fluency with multiplication facts for numbers up to at least 10 and the related division facts. Identify factors of whole numbers and multiples of whole numbers to 10.

Examples:

- Complete basic facts like $9 \times 4 = \square$ and $35 \div 7 = \square$ quickly and accurately.
- List all the factors for 36.
- Find the common multiples of four and six.

4.1.6 Solve problems fluently by using multiplication of two-digit numbers by a single-digit number and by using multiplication of two-digit numbers by other two-digit numbers. Use a standard algorithmic approach.

Example: If there are 24 boxes with 36 pencils in each, what is the total number of pencils? Estimate and then compute the product.

4.1.7 Model addition and subtraction of simple fractions.

Example: Using pattern blocks show that if the yellow hexagon equals one whole, which part of the hexagon represents $1 - \frac{1}{3}$?

4.1.8 Construct and analyze line plots. Given a set of data or a graph, describe the distribution of the data using median, range or mode.

Example: Display the following amounts of seconds from your science experiment: 16, 22, 16, 9, 11, 16 and 11 as a line plot. Identify the median, range and mode of your data.

4.1.9 List all the possible outcomes of a given situation or event. Represent the probability of a given outcome using a picture or other graphic.

Example: The Circle Snack Shop has three flavors of ice cream: vanilla, chocolate and strawberry. The ice cream can be served in a sugar cone, waffle cone or dish. List all the possible combinations of flavors of ice cream and how they are served.

Standard 2

Algebra and Functions

4.2.1 Write and solve equations with the symbol for equals to (=) to show equivalence and use the symbol for equals to (=) with variables to express mathematical relationships involving multiplication and division.

Examples:

- Find the number n which satisfies the equation $n \times 7 = 42$.
- Solve the equation $n \times 6 = 9 \times 4$.

4.2.2 Create, extend and give a rule for number patterns using multiplication, division, non-numeric growing and non-numeric repeating patterns.

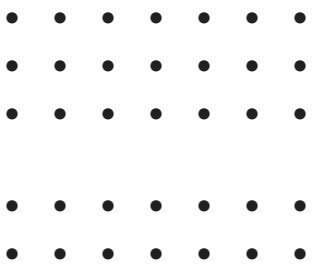
Example: Given a verbal description, create a different representation of a pattern or sequence.

4.2.3 Show that the order in which two numbers are multiplied (commutative property) and how numbers are grouped in multiplication (associative property) will not change the product. Use these properties together to show that numbers can be multiplied in any order.

Example: Draw or build arrays to show that three rows of eight objects use the same number of objects as eight rows of three objects.

4.2.4 Use the distributive property in expressions involving multiplication.

Example: Use the array model to show that $5 \times 7 = (3 \times 7) + (2 \times 7)$.



Standard 3

Geometry and Measurement

CORE STANDARD

Geometry and Measurement

Angles and Lines

Identify, describe and draw parallel and perpendicular lines and right, acute, obtuse and straight angles.

[Standard Indicators: 4.3.1, 4.3.2]

Rectangles

Find and use the perimeter and area of rectangles, including squares.

[Standard Indicator: 4.3.5]

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4.3.1 Identify, describe and draw pairs of parallel lines, perpendicular lines and non-perpendicular intersecting lines using appropriate mathematical tools and technology.

Example: Using their arms, students will model parallel lines, perpendicular lines and non-perpendicular intersecting lines.

4.3.2 Identify, describe and draw right angles, acute angles, obtuse angles, straight angles and rays using appropriate tools and technology.

Example: Draw two rays that meet to form each of the angles listed above.

4.3.3 Identify shapes that have reflectional and rotational symmetry.

Example: Make a masking tape frame on the floor for a cardboard equilateral triangle. Mark one corner of an equilateral triangle that fits the frame and the corresponding corner on the frame. Rotate the triangle clockwise until it again fits the frame, rotating about what could be called the center of the triangle. Continue to rotate the triangle until it fits again, and continue until the triangle returns to its original position inside the frame. Count how many times the shape will fit in the frame until it returns to its original position. Discuss this triangle as having rotational symmetry of the order of three.

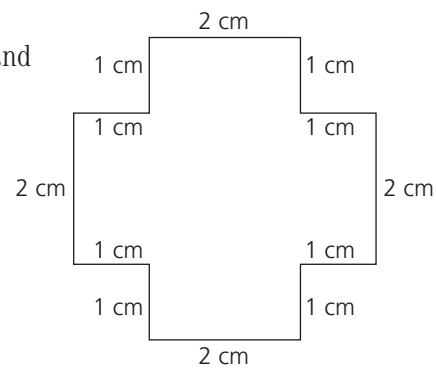
4.3.4 Measure and draw line segments to the nearest eighth-inch and millimeter.

Example: Measure across the face of a nickel to the nearest millimeter.

4.3.5 Develop and use formulas for finding the perimeter and area of rectangles (including squares) by using appropriate strategies (i.e., decomposing shapes), tools and units of measure.

Examples:

- Measure the length and width of a basketball court and find its area in suitable units.
- Find the area and perimeter of the following shape.



PROCESS STANDARDS

Indiana's Academic Standards for Mathematics describe the key content of each grade level and course, and students must develop conceptual understanding of this content. The American Diploma Project noted that, "beyond acquiring procedural mathematical skills with their clear methods and boundaries, students need to master the more subjective skills of reading, interpreting, representing and 'mathematicizing' a problem" (p. 55).

The National Council of Teachers of Mathematics has described five Process Standards that "highlight ways of acquiring and using content knowledge" (p. 29). The following Process Standards must be addressed throughout the learning and teaching of Indiana's Academic Standards for Mathematics in all grade levels in mathematics.

Problem Solving

- Build new mathematical knowledge through problem solving.
- Solve problems that arise in mathematics and in other contexts.
- Apply and adapt a variety of appropriate strategies to solve problems.
- Monitor and reflect on the process of mathematical problem solving.

Reasoning and Proof

- Recognize reasoning and proof as fundamental aspects of mathematics.
- Make and investigate mathematical conjectures.
- Develop and evaluate mathematical arguments and proofs.
- Select and use various types of reasoning and methods of proof.

Communication

- Organize and consolidate mathematical thinking through communication.
- Communicate mathematical thinking coherently and clearly to peers, teachers and others.
- Analyze and evaluate the mathematical thinking and strategies of others.
- Use the language of mathematics to express mathematical ideas precisely.

Connections

- Recognize and use connections among mathematical ideas.
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
- Recognize and apply mathematics in contexts outside of mathematics.

Representation

- Create and use representations to organize, record and communicate mathematical ideas.
- Select, apply and translate among mathematical representations to solve problems.
- Use representations to model and interpret physical, social and mathematical phenomena.

In addition, estimation, mental computation and technology are areas that need to be addressed at all grade levels in mathematics.

Estimation and Mental Computation

- Know and apply appropriate methods for estimating the results of computations.
- Round numbers to a specified place value.
- Use estimation to decide whether answers are reasonable.
- Decide when estimation is an appropriate strategy for solving a problem.
- Determine appropriate accuracy and precision of measurements in problem situations.
- Use properties of numbers and operations to perform mental computation.
- Recognize when the numbers involved in a computation allow for a mental computation strategy.

Technology

- Technology should be used as a tool in mathematics education to support and extend the mathematics curriculum.
- Technology can contribute to concept development, simulation, representation, communication and problem solving.
- The challenge is to ensure that technology supports, but is not a substitute for, the development of skills with basic operations, quantitative reasoning and problem-solving skills.
  - Elementary students should learn how to perform thoroughly the basic arithmetic operations independent of the use of a calculator.
  - The focus must be on learning mathematics and using technology as a tool rather than as an end unto itself.

References

American Diploma Project (2004). *Ready or Not: Creating a High School Diploma that Counts*. Washington, D.C.: Achieve, Inc.

National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics*. Reston VA: author.